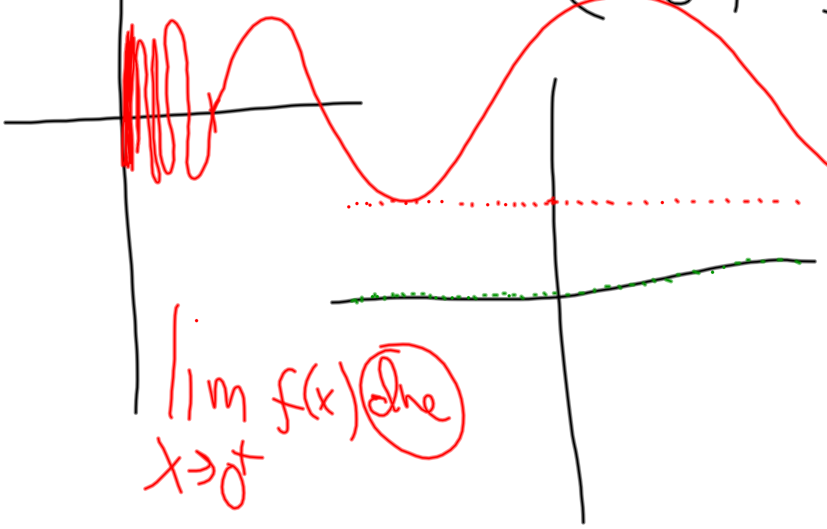
$f(x) = \sin\left(\frac{1}{x}\right)$

$$f(x) = \begin{cases} 1, & \text{if } x \text{ is rational} \\ 0, & \text{if } x \text{ is irrational} \end{cases}$$

$\to \sqrt{2}, \pi, e$

$\sqrt{\text{prime}}$ . . .



$\lim_{x \to 0^+} f(x)$ dne

(136 top)

$$\lim_{x\to+\infty} \sqrt{x^6+5} - x^3 = \lim_{x\to\infty} \frac{\sqrt{x^6+5}-x^3}{1} \cdot \frac{\sqrt{x^6+5}+x^3}{\sqrt{x^6+5}+x^3}$$

indeterminate

$$= \lim_{x\to\infty} \frac{(x^6+5)-x^6}{\sqrt{x^6+5}+x^3} = \lim_{x\to\infty} \frac{5}{\sqrt{x^6+5}+x^3}$$

$$= \lim_{x\to\infty} \frac{x^3\left(\frac{5}{x^3}\right)}{\sqrt{x^6}\left(\sqrt{1+\frac{5}{x^6}}\right)+x^3(1)} = \lim_{x\to\infty} \frac{x^3\left(\frac{5}{x^3}\right)}{x^3\sqrt{1+\frac{5}{x^6}}+x^3(1)}$$

$$= \lim_{x\to+\infty} \frac{x^3\left(\frac{5}{x^3}\right)}{x^3\left(\sqrt{1+\frac{5}{x^6}}+1\right)}$$

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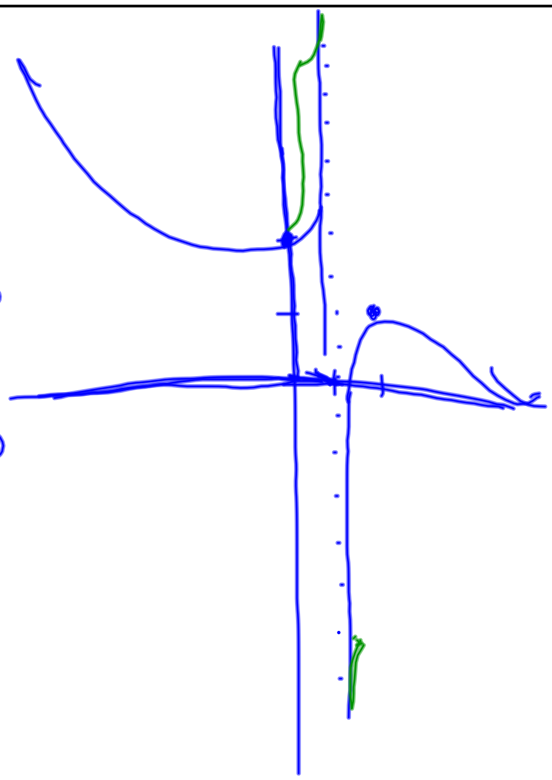
i) $f(0)=2$ and $f(2)=1$

ii) $\lim_{x\to 1^-} f(x)=+\infty$ and $\lim_{x\to 1^+} f(x)=-\infty$

iii) $\lim_{x\to +\infty} f(x)=0$ and $\lim_{x\to -\infty} f(x)=+\infty$



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